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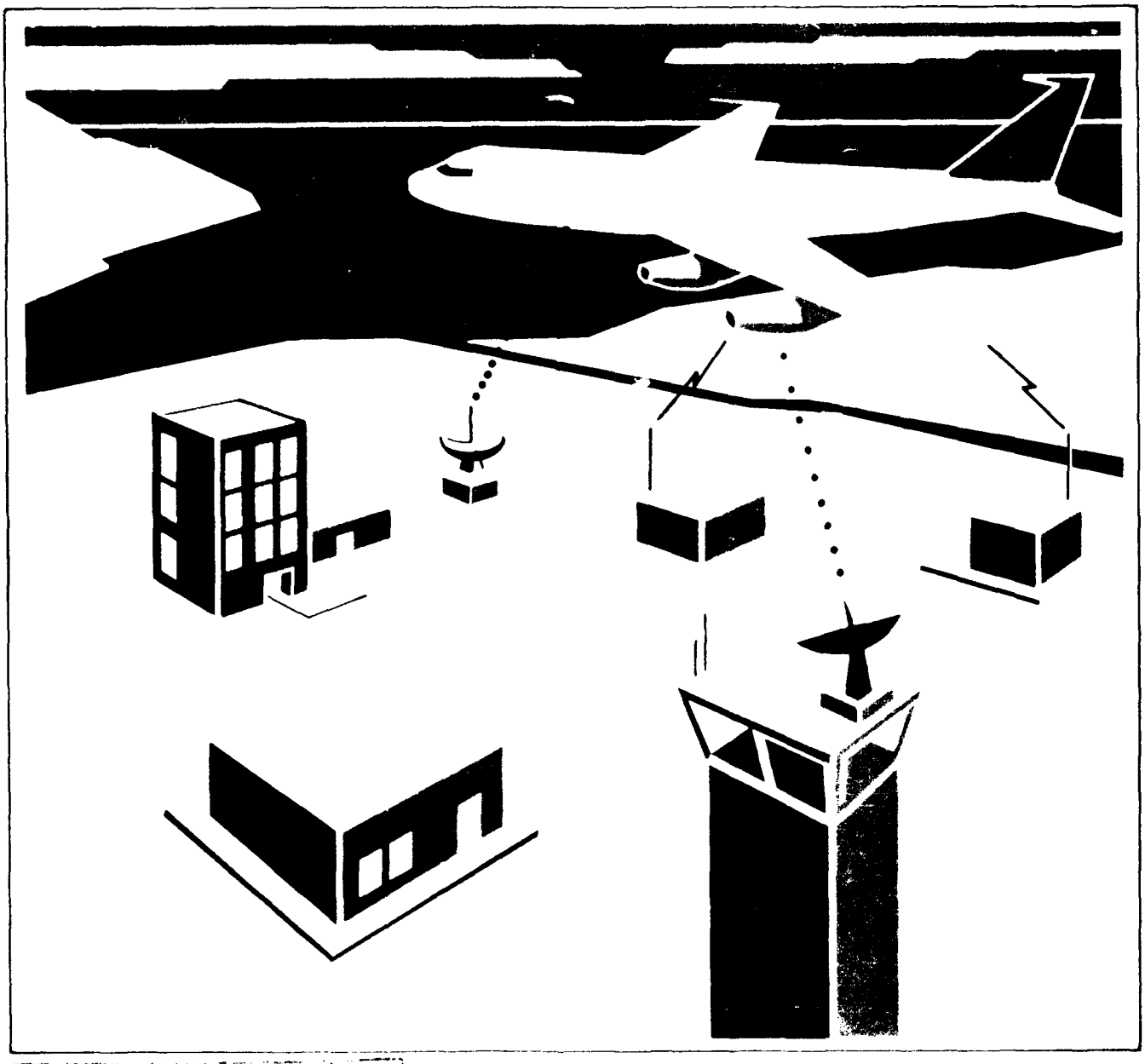
National Airspace System

U.S. Department of Transportation
Federal Aviation Administration

System Effectiveness Operational Concept NAS-SR-138



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16. Abstract

A requirement for the National Airspace System (NAS) is to provide for system effectiveness as identified in the NAS System Requirements Specification (NASSRS).

This operational concept is one of many high level documents that will, in total, describe the operation of the NAS when the projected upgrade is complete (i.e., "end state"). These documents will assist in linking the requirements specified in the NASSRS with the NAS design. This particular concept describes system effectiveness as described in paragraph 3.8 of the NASSRS, including the following four paragraphs: 3.8.1 Operational Readiness, 3.8.2 Response Times, 3.8.3 Immediate Backup, and 3.8.4 Security.

This concept, and the other seven operational concepts, will complete the description of the system requirements as described in the NASSRS.

The eight operational concepts are: Communications (NAS-SR-136); Navigation (NAS-SR-134); Monitoring (NAS-SR-133); Maintenance and Support (NAS-SR-137); System Effectiveness (NAS-SR-138); Air Defense (NAS-SR-135); Flight Planning (NAS-SR-131); and Traffic Control and Airspace Management (NAS-SR-132).

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1.0 INTRODUCTION

1.1 Background

National Airspace System (NAS) equipment, systems, installations, and facilities must be designed to ensure that they perform intended functions under any foreseeable operating conditions. The NAS shall meet the user/specialist-related measures of effectiveness described in the following sections. Compliance with these requirements shall be proven by analysis and, where necessary, by appropriate simulation or test.

The National Airspace System System Requirements Specification (NASSRS), NAS-SR-1000, is the top level system requirements document for the NAS. The contents are a compilation of required operational capabilities for the NAS as envisioned to exist when the NAS Plan (Capital Investment Plan) is fully implemented. The primary intention of NAS-SR-1000 is for FAA internal use as a management tool in support of the NAS design, engineering, acquisition activities, and control of change to the NAS operational requirements.

This operational concept document has been developed using an established standard format and is consistent in structure with a series of operational concepts written about various sections of the NASSRS.

1.2 Objective

The objective of this operational concept is intended to define system effectiveness in the future NAS. This is the total NAS viewed as a complete system as presently approved as of the date of this operational concept document. It is intended to be a descriptive document which provides FAA management and technical personnel, as well as user organizations, with a clear understanding of system effectiveness within the NAS. More specifically, the objective of this document is to:

Provide a common operational perspective across those subsystems, operators, and users that provide system effectiveness.

Show the interrelationship between subsystems, facilities, information, and operators/users.

1.3 Scope

This operational concept describes how system effectiveness is provided in the NAS as outlined in Section 3.8 of the NASSRS. The operations described are limited to those associated solely with system effectiveness. The names assigned to the specialists who perform these operations are based on the primary functions performed. While these names, which are based on today's operations, may change as the NAS evolves, the functions performed should not.

The specific paragraphs in the NASSRS Section 3.8 are as follows:

3.8 System Effectiveness

- 3.8.1. Operational Readiness
  - 3.8.1.A Categorization of Impact of Loss of Service
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- 3.8.3.J Military Facilities

3.8.4 Security
- 3.8.4.A Physical Security
- 3.8.4.B Administrative Security
- 3.8.4.C Technical Security

1.4 Methodology

The methodology employed to develop this operational concept is similar to the methods and tools used for system development in that successive levels of decomposition of the system effectiveness functions are represented. This document starts with the overall concept and proceeds to its most elemental levels of support, diagrammatic tools, and techniques that constitute system effectiveness within the NAS. These analytical tools are:

1. Operational Block Diagram/Description. The operational block diagram illustrates the connectivity between major elements of the NAS, i.e., processors, specialists/controllers, and the user for those elements that support the service. The operational block diagram in this operational concept is extracted from the overall NAS operational block diagram. Principal features of the operational block diagram/description include the following:

   a. Each specialist/controller is indicated by a number. This number remains the same in every NASSRS operational concept.

   b. Dotted lines segregate facilities.

   c. Solid lines show digital data flow, and voice data flow is also shown. Each type of data flow is appropriately labeled.

   d. The blocks within each facility are the major processors.

2. Operational Flow Diagrams. An operational flow diagram and associated description for each specialist provides detail about the inputs, processes, outputs, and interfaces for each operator; thus, the operational flow diagram provides an expansion of each element of the NAS shown in the system effectiveness master block diagram. Operational flow diagrams are used to functionally describe the products and services of individual specialists.

   a. Dotted lines segregate facilities.

   b. Larger white boxes at the center of each diagram indicate specialist/controller/user functions. Shaded boxes indicate supporting systems.

c. The functions listed by lower case alphabetic characters in the white and shaded boxes are explained in the text.

3. Operational Sequence Diagrams/Descriptions. The operational sequence diagram and associated description show a typical sequence of steps taken by operators/users in supporting system effectiveness operations. Principal features of an operational sequence diagram include the following:

   a. Users, specialists, and computer systems involved with providing system effectiveness functions are listed along the vertical axis. When required for clarity, other FAA facilities may also be listed on the vertical axis.

   b. The horizontal axis represents time. Sequential events or functions performed are indicated within separate boxes. Events which may occur simultaneously or near-simultaneously are shown vertically.

   c. Decision points or points where alternate paths may be followed are indicated by a diamond shape.

   d. Circles are connectors and indicate exit to, or entry from, another diagram. Circles with a lower case alphabetic character reference an operator function described in the figure listed below the circle. Circles connect either to another sheet of the same diagram or to another diagram; the relevant figure number is listed underneath if connection is to a different diagram. Thus, the relationship between operator/user interactions and relevant NAS subsystems can be depicted.

4. Operational Scenario Diagrams/Descriptions The operational scenario diagram and associated descriptions depict a specific predefined situation and illustrates a particular subset of the generalized operational sequence or unusual situation not covered by the operational sequence diagrams. Principal features of operational scenario diagrams include the following:

   a. Users and specialists/controllers involved with providing the service are listed along the vertical axis.

   b. The horizontal axis represents time. Sequential events or functions performed by an operator/user are indicated within separate boxes. The numbers on the right side of the blocks refer to numbers in the text.

1.5 Document Organization

The remainder of this document is organized as Section 2, System Effectiveness Operations is divided into six subsections:

Section 2.1 Support provides an overview description of the system effectiveness functions and introduces (identifies) the personnel complement and physical entities (facilities and computer systems), which provide the required support.

Section 2.2 Information describes the information used to provide system effectiveness support.

Section 2.3 Functions provides descriptions of the functions performed by specific types of NAS personnel in conjunction with system effectiveness services.

Section 2.4 Correlation of Operational Requirements correlates the system effectiveness requirements paragraphs of NAS-SR-1000 with the paragraphs that describe the functions being performed by the specialists/controllers.

Section 2.5 Operational Sequences illustrates the interactions between NAS personnel and systems during the planning and implementation phases of system effectiveness.

Section 2.6 Operational Scenarios describes operational scenarios for hypothetical interactions between users and operators/specialists for specific cases.

2.0 OPERATIONS

2.1 Support

NAS equipment, systems, installations, and facilities whose functioning is required by the service described in this document must be designed to ensure performance of these functions under any foreseeable operating conditions. The NAS shall meet the user/specialist-related measures of effectiveness described in the following sections. Compliance with these requirements shall be proven by analysis and, where necessary, by appropriate simulation or test.

Additionally, the NAS shall prevent disclosure to unauthorized persons or processes information that is either classified in the interest of national security or sensitive because of its operational or administrative nature. Access to information, facilities, and equipment shall be controlled. The NAS is concerned with three types of security: physical, administrative, and technical.

The following paragraphs describe, in detail, paragraph 3.8 of the NASSRS.

2.1.1 Operational Readiness

NAS equipment, systems, installations and facilities shall be kept in an operable and committable state according to their criticality to safe operation and control of aircraft. NAS services to the user/specialist are categorized according to the severity of impact of loss of that service on safe separation and control of aircraft. These NAS services as required by this document are categorized in Table I-1 located in Appendix I. These categories are:

> Critical - Functions or services which, if lost, would prevent the NAS from exercising safe separation and control over aircraft. Examples are air-ground communications and radar data used for separation of IFR traffic.
>
> Essential - Functions or services which, if lost, would reduce the capability of the NAS to exercise safe separation and control over aircraft. Examples are real-time weather information and remote airport lighting system control.
>
> Routine - Functions or services which, if lost, would not significantly degrade the capability of the NAS to exercise safe separation and control over aircraft. Examples are training and administration.

Certain parts of NAS information may be considered critical, essential, and routine. For example, information about aircraft separation information (para. 3.2.3 of the NASSRS) such as acquiring actual flight information (para. 3.2.3.A) is considered critical. Information on acquiring flight plans (para. 3.2.3.B) is essential, and weather information for flight path prediction (para. 3.2.3.D) is only considered routine.

Please refer to Table I-1, in Appendix I for the complete list of functional categories.

The availability goal in the end-state NAS for a function or service to the user/specialist is expressed as the ratio of the total time the service is provided to the user/specialist to the maximum available operating time. Service availability is not less than that provided by existing capabilities. These time ratios are as follows:

Critical services - .99999

Essential services - .999

Routine services - .99

No single failure of equipment, system, installation or facility shall cause loss of service to the user/specialist. The goal for a single loss of service to a user/specialist shall not exceed the duration shown below:

Critical services - 6 seconds

Essential services - 10 minutes

Routine services - 1.68 hours

The frequency of occurrence goal for any loss of service shall not exceed one per week.

2.1.2 Response Times

Certain response times have been specified for the NAS to produce or process specific information. The numbers provided in Table II-1, in Appendix II, are identified as a mean, 99th percentile, or maximum value.

For example, due to its critical nature, flight information (data) concerning traffic advisories has a mean response time of 0.6 seconds, a 99th percentile response time of 1.2 seconds, and a maximum response time of 3.0 seconds. Flight plan submission and evaluation, due to a less critical nature, has longer response times. For this type of information the mean is 4.0 seconds, a 99th percentile response of 6.0 seconds, and a maximum response time of 12.0 seconds.

2.1.3 Immediate ACF Backup

The NAS is required to provide a capability to take over the control area of an Area Control Facility (ACF) in the event of a catastrophic failure of an individual ACF. A catastrophic failure is considered to be the inability of an ACF to perform its operational responsibilities, regardless of cause, as determined by operational authorities.

ACF

An ACF will normally operate with its Area Control Computer Complex (ACCC) processing in the full service mode, maintaining interfacility communications between the ACCC, external ACCCs and Tower Control Computer Complexes (TCCCs). In the event of a catastrophic failure of an ACF, the normal existing work force of controllers at adjacent facilities will assume portions of the failed airspace and, using available equipment, will provide required services to stabilize the affected airspace. This backup concept requires that the system be prepared to transfer control of those NAS resources responsible for the control of aircraft to the supporting facilities.

Additionally, any operational site will be able to perform emergency software maintenance if communication is lost with the FAA Technical Center (FAATC). The ACCC shall have the capability to modify object code and implement data bases necessary for support or system recovery at the ACCC and associated TCCCs when directed.

In the event of an ACF failure the NAS provides the capability to reconfigure air-to-ground voice communications to achieve communications with aircraft in adjacent airspace assigned to positions within the backup facility. The NAS also provides the capability to reconfigure ground-to-ground voice communications to achieve communications between control positions within the backup facility and control positions in other facilities.

Surveillance data is also provided to backup facilities for their respective backup areas. The NAS also supplies each backup ACF with the requisite flight data for assigned backup responsibilities. This flight data is sufficient to allow flight plan association and creation of flight data displays upon activation of the backup procedure.

The NAS provides the capability for facilities to exchange status condition information for backup purposes. This capability provides for an ACF to continuously notify each of its backup facilities and the Air Traffic Control Command Center (ATCCC) of its status. The affected ACF will notify its backup facilities, associated terminals and ATCCC when it is unable to maintain normal operation. These facilities, in turn, will notify other associated facilities of this alert and implement the backup capability.

The Traffic Management System will participate in the backup effort by limiting aircraft flow into and rerouting aircraft around the failed facility's airspace.

The NAS provides the capability for the rapid reassignment of operational and backup sectors to any operating or training position in the facility.

ATCT

Airport traffic control towers (ATCTs) have the capability to operate their TCCC independently of their parent ACF in the event of an ACF failure. Those ATCTs which receive surveillance data are capable of expanding their display range (within the limits of available processing capacity) beyond that used in normal operation.

The NAS provides the capability to perform the required backup support functions while meeting response time requirements. These response times include:

Failure detection, verification and system notification within ten seconds following an ACF failure

Automatic track initiation and flight plan association in the backup airspace within 60 seconds of an ACF failure

Implementation of the backup operation within two minutes of an ACF failure.

The NAS provides processing and communications capacities to support the required backup capabilities and to meet the response time requirements specified above, while maintaining safe separation of all aircraft receiving ATC services (i.e., both normal and backup sectors) from the backup facilities. Additionally, maintenance personnel in the ATCTs are capable of modifying the TCCC object code, and building and implementing data bases in the stand-alone mode.

Military Facilities

The NAS provides appropriate voice and data communications connectivity between designated military facilities and designated backup ACFs. In the event of an ACF failure the backup ACF communicates with military facilities through voice channels and passes flight plan or aeronautical information through data channels.

2.1.4 Security

The NAS provides three types of security to prevent unauthorized access to information, equipment, and facilities. The first, physical security, prevents unauthorized access or damage to equipment and facilities. Physical access to equipment and facilities is controlled by appropriate means, such as fencing, guards, and locked doors. An immediate alarm is made to appropriate personnel when an attempt to violate physical security is detected. Electromagnetic protection measures are provided at facilities where necessary to provide adequate security and protection of NAS systems. Appropriate containers are provided for the storage of classified or sensitive information.

The second, administrative security, is provided in the form of rules and procedures for access to facilities and information. The NAS develops criteria for determination of individuals and classes of personnel who require access or clearances on a need-to-know basis. Controls for keys, access codes and passwords for facilities and information are also provided.

The third, technical security, is provided in order to enforce the established rules and procedures. Logical controls are built into information systems to prevent unauthorized persons from gaining access. Where necessary, cryptography is used to deny effective use of information even if access is gained.

2.1.5 Positions/Systems/Functions

Figure 2-1 is an overview of NAS/user interfaces for system effectiveness and illustrates the NAS facilities and systems involved. Figure 2-2 is an operational block diagram showing the inter-relationships between equipment, facilities, operators/users and the information necessary to support system effectiveness within the NAS.

Position 35: ACF NAS Operations Manager/System Engineer
Function: The NAS Operations Manager/System Engineer monitors ACF area equipment and subsystem activities and initiates the ACF backup actions when required.
Description: The NAS Operations Manager/System Engineer initiates the backup ACF procedures once notified by facility management personnel.

Procedures:	FAA Order 7210.3J Facility Operation and Administration
Projects:	Capital Investment Plan, Chapter 2, Section 1: Project 21-12 Advanced Automation System (AAS); Section 6: Project 26-04 Maintenance Control Center (MCC)

Position 36: ATCT Data System Specialist
Function: Data System Specialist.
Description: In addition to normal duties these specialists in an ATCT convert the TCCC to the stand alone mode in the event of an ACF failure.

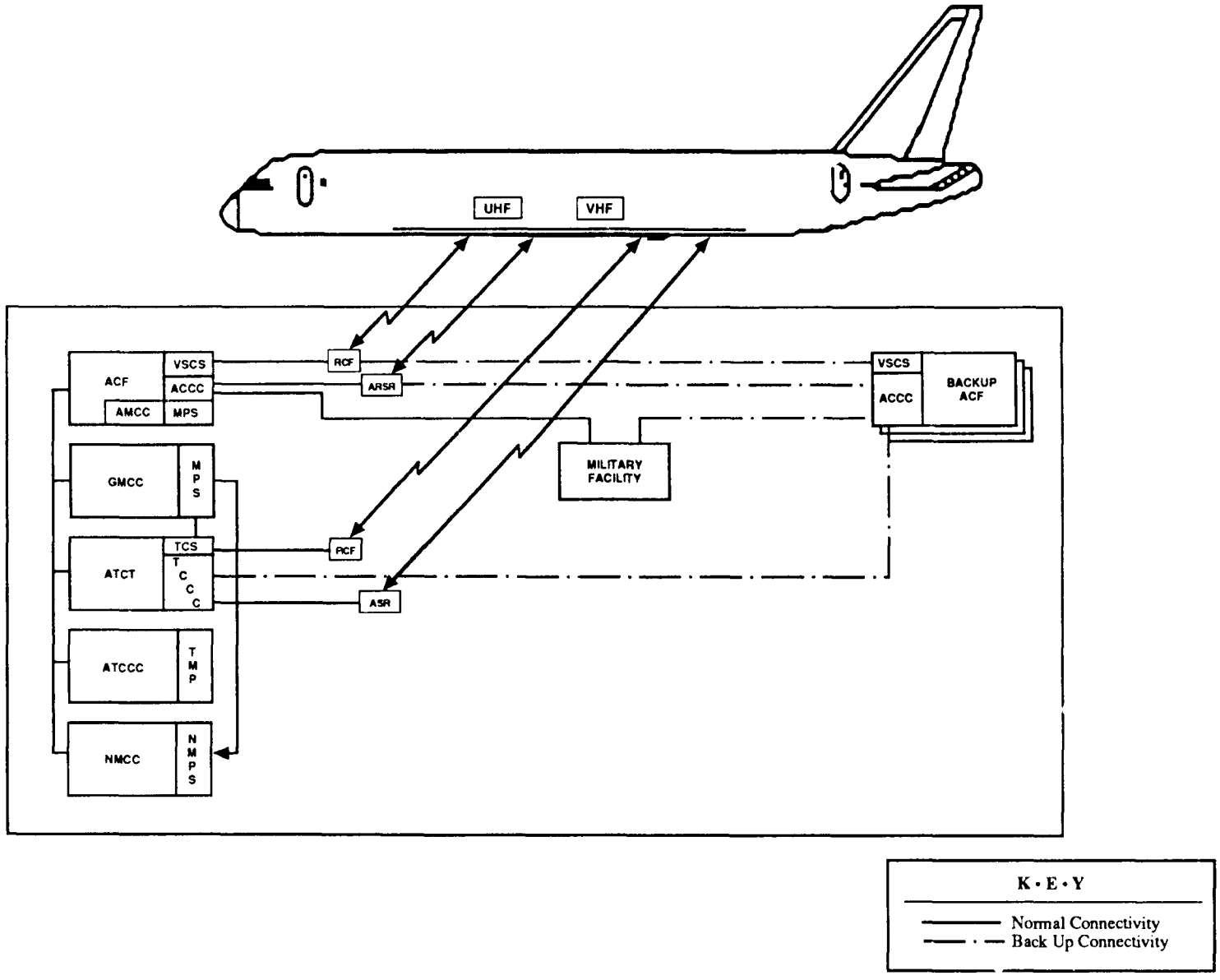

FIGURE 2-1
OVERVIEW OF NAS/USER INTERFACES
FOR SYSTEM EFFECTIVENESS

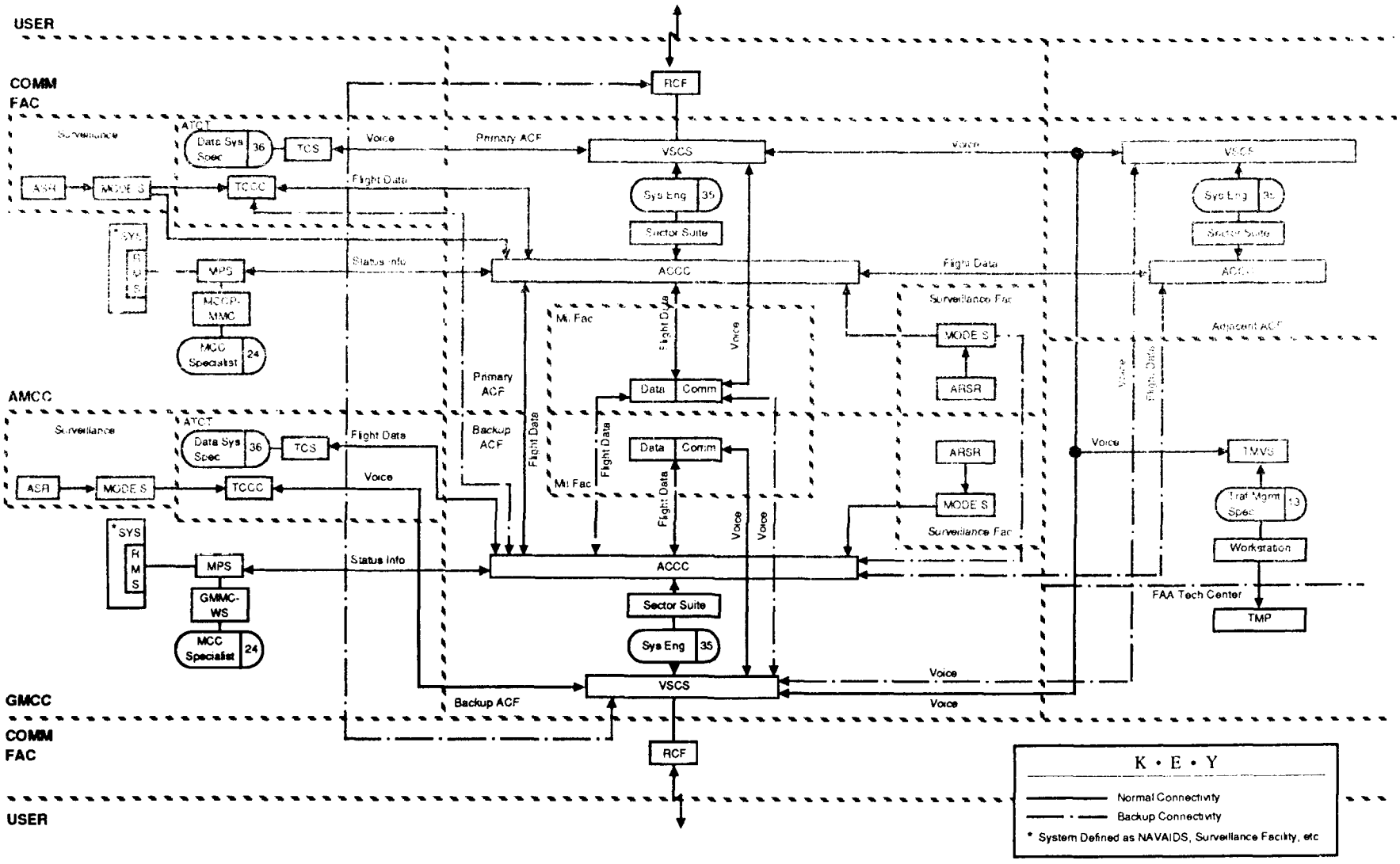

FIGURE 2-2
SYSTEM EFFECTIVENESS OPERATIONAL BLOCK DIAGRAM

Procedures: FAA Order 7210.3J Facility Operation and Administration

Projects: Capital Investment Plan, Chapter 4, Section 2: Project 42-20 Airport Traffic Control Tower System Connectivity

Position 24: MCC Specialists/NAS Area Specialist
Function: In addition to regularly assigned duties, MCC Specialists in an ACF MCC (called NAS Area Specialist) or in a GNAS MCC (GMCC) remotely monitor system and equipment status. Should failures occur, these specialists initiate corrective actions through RMMS and notify the work force.
Description: Specialists in an MCC that report the status of a failed ACF and supporting equipment/systems.

Procedures: FAA, Maintenance Handbook for Airway Facilities (6000.15A)

Projects: Capital Investment Plan, Chapter 2, Section 6 - Maintenance and Operations: Project 26-01 Remote Maintenance Monitoring System (RMMS); 26-04 Maintenance Control Center (MCC)

Position 13: Traffic Management Specialists
Function: Specialists working in the Central Flow Control Facility coordinate the flow of air traffic with Traffic Management Specialists within ACFs and major ATCTs.
Description: Traffic Management Specialists provide national level management and monitoring of current air traffic flow, aircraft operations, en route sector and airport utilization.

Procedures: FAA Order 7210.47A Traffic Management System

Projects: Capital Investment Plan, Chapter 2, Section 1: Project 21-06, Traffic Management System (TMS); Section 5, Project 25-007 National Airspace Data Interchange Network (NADIN) II; Section 6: Project 26-14: National Radio Communications System (NARACS).

2.2 Information

In the event of an ACF failure, flight plan, surveillance data, and status information must be passed between the adjacent backup ACFs through their ACCCs. This information enables controllers to provide continuous ATC services to aircraft within the failed ACFs' airspace.

2.2.1 Backup ACF to Adjacent ACF

Facility backup is the national ATC system's defense against catastrophic failure of an ACCC/ACF. In facility backup, responsibility for the aircraft under control of a failed facility is assumed by other ACCC/ACFs. The ACCCs will support facility backup by routine exchange of critical flight data. Upon the catastrophic failure of any one ACCC, other adjacent ACCCs are capable of taking up the tasks of the failed ACCC including support of the TCCCs served by the failed ACCC. The facility backup processing includes the following functions:

Critical flight data processing
Surveillance data processing
Facility backup transition processing

After the transition to facility backup is in effect, voice and data communications are processed the way they are normally processed, through the National Airspace System Interfacility Communications System (NICS). The NICS combines or integrates communications functions into one network which provides voice and data communications interconnectivity between facilities and sites within the NAS.

2.2.2 Backup ACF to Adjacent ATCT

When a parent ACF fails, and communications with the parent ACCC become unavailable, the TCCC transitions to a stand-alone mode of operation. In this mode, the TCCC performs limited surveillance processing functions (if available) locally and continues to provide those flight data processing and display functions that do not require communications with the ACCC.

In the stand-alone mode the TCCC interacts with airport systems and provides the following:

Surveillance data processing
Flight data processing
Airport environmental data processing

When the TCCC's parent ACCC is no longer capable of supporting it and the TCCC receives notification from the alternate ACCC that it has transitioned into backup, the TCCC shall treat the alternate ACCC as its parent and initiate ATC data exchange with the new parent. The TCCC has the capability to transition back to normal mode when communication with a parent ACCC becomes available.

2.2.3 Backup ACF to Adjacent Military Facilities

The ACCC exchanges flight data with military base operations (MBO). The ACCC receives flight plan amendments, cancellation messages from MBO and provides MBO with general information messages. In the event of an ACF failure, the NAS provides appropriate voice and data communications connectivity between designated military facilities and designated backup ACFs.

2.3 Functions

The following paragraphs describe in more detail the functions provided by the specialist positions introduced in Section 2.1. The operational flow diagrams associated with each paragraph illustrate the information flow between the specialists within their respective facility and the user, and between the specialists and data processing equipment. The functions performed by the NAS are explicitly covered by requirements specified in the NASSRS. The pertinent NASSRS paragraphs that specify the function being performed by the NAS are referenced in each of the paragraphs that follow.

2.3.1 ACF NAS Operations Manager/System Engineer (Position 35)

The NAS Operations Manager/Systems Engineer monitors the subsystems within the ACF. In the event of an ACF failure the NAS Operations Manager will implement the ACF backup plan.

Figure 2-3 is an operational flow diagram describing the interfaces provided to the specialists at the ACF. Functions performed by the equipment and these specialists are lettered within each block and are described in the corresponding paragraphs below.

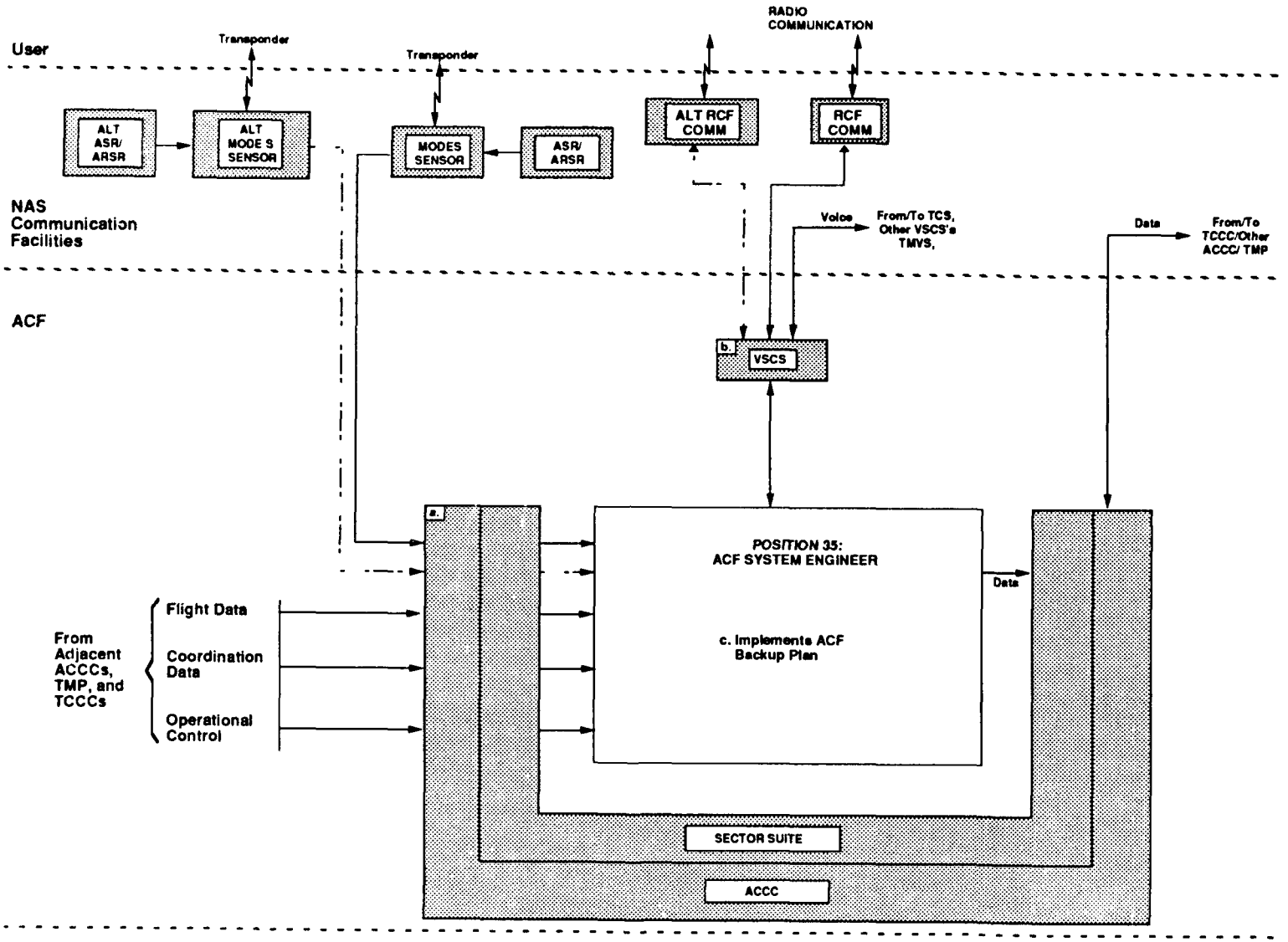

FIGURE 2-3
ACF SYSTEM ENGINEER (POSTITION 35)
OPERATIONAL FLOW DIAGRAM

a. ACCC Processing. The ACCC communicates and coordinates its operational status with other ACCCs and the Traffic Management Processor (TMP). The ACCC provides the capability for implementation of the backup operation within two minutes of an ACF failure. The ACCC provides the capability to reconfigure air-ground, ground-ground communications and surveillance data in the event of an adjacent ACF failure. Automatic track initiation and flight plan association is available within 60 seconds of an ACF failure. The ACCC also provides the capability to obtain or provide requisite flight data for assigned backup positions. ACF personnel can reconfigure a backup ACF to provide for additional positions to handle the increased airspace.

NASSRS Requirement 3.8.3.A - J

b. Voice Switching and Control System (VSCS). The VSCS provides the primary air-ground communications capability for controllers in the backup ACF to communicate with aircraft in the failed ACF's airspace. VSCS operates in conjunction with the radio control equipment (RCE) and the VHF/UHF communications outlet to provide two-way communications capability. VSCS receives area/sector and facility reconfiguration control from the ACCC to facilitate these functions. VSCS provides the primary ground-ground interphone function as a voice switch which provides voice connectivity between air traffic operational positions within the ACF and specialists in adjacent ACFs, as well as other NAS and military facilities.

NASSRS Requirement 3.8.3.A, B

c. Implements ACF Backup Plan. The NAS Operations Manager/Systems Engineer implements the ACF backup plan in the event of an ACF failure.

NASSRS Requirement 3.8.3.A - I

2.3.2 ATCT Data Systems Specialist (Position 36)

ATCT Data Systems Specialists initiates stand-alone mode utilizing the processing capabilities of the TCCC. Figure 2-4 is an operational flow diagram describing the interfaces provided to the specialists at the ATCT. Functions performed by the equipment and these specialists are lettered within each block and are described in the corresponding paragraphs below.

a. TCCC Processing. The TCCC provides stand-alone mode of operation to the ATCT when communications with the parent ACCC become unavailable. In this mode the TCCC performs limited surveillance processing functions locally and continues to provide those flight data processing and display functions that do not require communications with the ACCC. When the TCCC receives notification from the alternate ACCC that it has transitioned into backup, the TCCC treats the alternate ACCC as its parent and initiates ATC data exchange with the new parent. The TCCC has the capability to transition back to normal mode when communication with a parent ACCC becomes available.

NASSRS Requirement 3.8.3.G

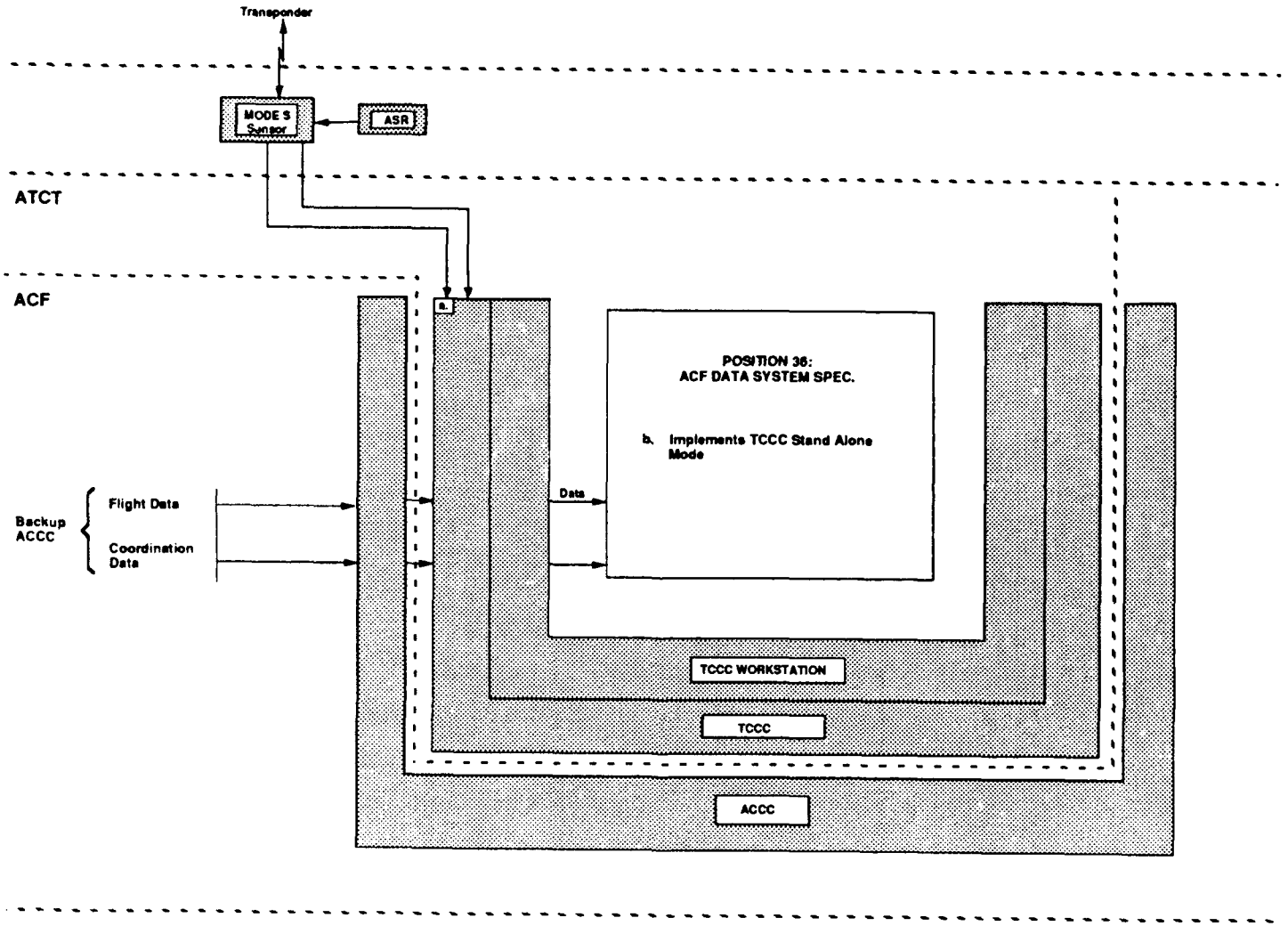

FIGURE 2-4
ATCT DATA SYSTEMS SPECIALIST (POSITION 36)
OPERATIONAL FLOW DIAGRAM

b. Implements TCCC Stand Alone Mode. The ATCT Data Systems Specialist initiates the stand-alone mode for the TCCC when alerted that the host ACF has failed.

NASSRS Requirement 3.8.3.G

2.3.3 ACF Maintenance Control Center (AMCC) Specialists/NAS Area Specialists (Position 24)

ACF MCC NAS Area Specialists, located in each ACF, monitor, control, and maintain specific NAS subsystems from centralized locations through the Maintenance Monitoring Console (MMC). The MMC provides access to maintenance data terminals (MDT) and Remote Monitoring Subsystems (RMSs) for status and maintenance control of all external subsystems and surveillance facilities which interface with the Maintenance Processor Subsystem (MPS).

Figure 2-5 is an operational flow diagram describing the functions and services provided by the MCC Specialist. Lettered blocks identify the functions performed by the specialist or system, which are described in the corresponding paragraph below.

a. Maintenance Processor Subsystem (MPS) Processing. The MPS provides the MCC specialist with access status data on those systems the MCC is required to monitor. The MPS accepts maintenance status and maintenance data from the ACCCs. The MPS sends maintenance control, maintenance management data, and NAS subsystem status data to the ACCCs.

NASSRS Requirement 3.8.3.E

b. Maintenance Control Center Processor - Maintenance Monitor Console (MCCP-MMC). The MCC consoles within the AMCC provide the MCC specialist with the capability to monitor and control NAS subsystems. The MCCP-MMC provides input/output and display capabilities, data processing capabilities for situation appraisals, and failure effects analysis needed for service restoration. The MCCP-MMC interfaces with the MPS and provides the interface to the MCC specialist for analysis of problems within the NAS subsystems/equipment. The MCCP-MMC interfaces with external Maintenance Data Terminals (MDT) and Remote Monitoring Subsystems (RMSs) through the MPS.

NASSRS Requirement 3.8.3.E

c. Remote Monitor and Control. MCC Specialist remotely monitor and control NAS equipment from the AMCC using their workstation. The MCC Specialist will perform system restoration when necessary.

NASSRS Requirement 3.8.3.E

d. Notification/Coordination. MCC Specialists notify and coordinate with other MCC specialists changes in status of NAS systems, including system failures.

NASSRS Requirement 3.8.3.E

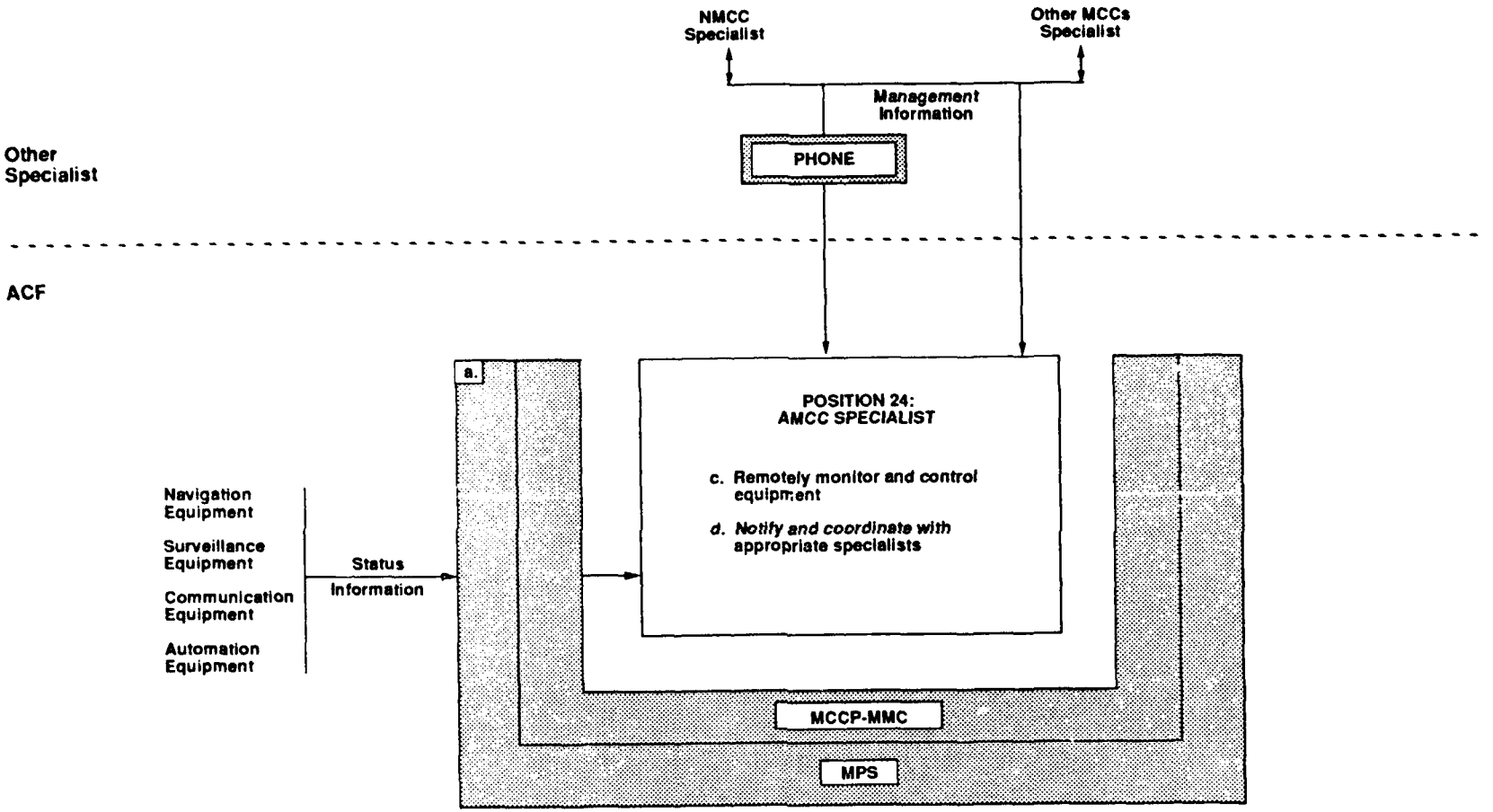

FIGURE 2-5
ACF-MCC (AMCC) SPECIALIST (POSITION 24)
OPERATIONAL FLOW DIAGRAM

2.3.4 GNAS Maintenance Control Center (GMCC) Specialists (Position 24)

GNAS MCC Specialists, located in Airway Facilities GNAS Sectors, monitor status information and collected performance data from NAS subsystems/ equipment.

Figure 2-6 is an operational flow diagram describing the functions and services provided by the MCC Specialist. Lettered blocks identify the functions performed by the specialist or system, which are described in the corresponding paragraph below.

a. Maintenance Processor Subsystem (MPS) Processing. The MPS provides the MCC Specialist status data on those systems the MCC is required to monitor. The MPS accepts maintenance status and maintenance data from the ACCCs. The MPS sends maintenance control, maintenance management data, and NAS subsystem status data to the ACCCs.

   NASSRS Requirement 3.8.3.E

b. GMCC Workstation. The GMCC workstation provides the MCC NAS Area Specialist with the capability to monitor and control NAS subsystems and facilities which interface with the MPS.

   NASSRS Requirement 3.8.3.E

c. Remote Monitor and Control. MCC Specialists remotely monitor and control NAS equipment from the GMCC using their workstation. The MCC Specialist will perform system restoration when necessary.

   NASSRS Requirement 3.8.3.E

d. Notification/Coordination. MCC Specialists notify and coordinate with other MCC specialists changes in status of NAS systems, including system failures.

   NASSRS Requirement 3.8.3.E

2.3.5 Traffic Management Specialists (Position 13)

Traffic Management Specialists are responsible for coordination and approval of all major intercenter flow control restrictions on a system basis in order to maintain maximum utilization of the airspace. Figure 2-7 is an operational flow diagram describing the functions and services provided by the Traffic Management Specialist. Lettered blocks identify the functions performed by the specialist or system, which are described in the corresponding paragraph below.

a. Traffic Management Processor. The TMP provides an automation capability to directly assist, support, and provide data base information for flow management, planning reservation, and contingency response to optimize the flow of traffic and minimize flight delays. The TMP exchanges flight data, traffic capacity reports, traffic situation reports, and traffic flow data with the ACCCs.

   NASSRS Requirement 3.8.3.E

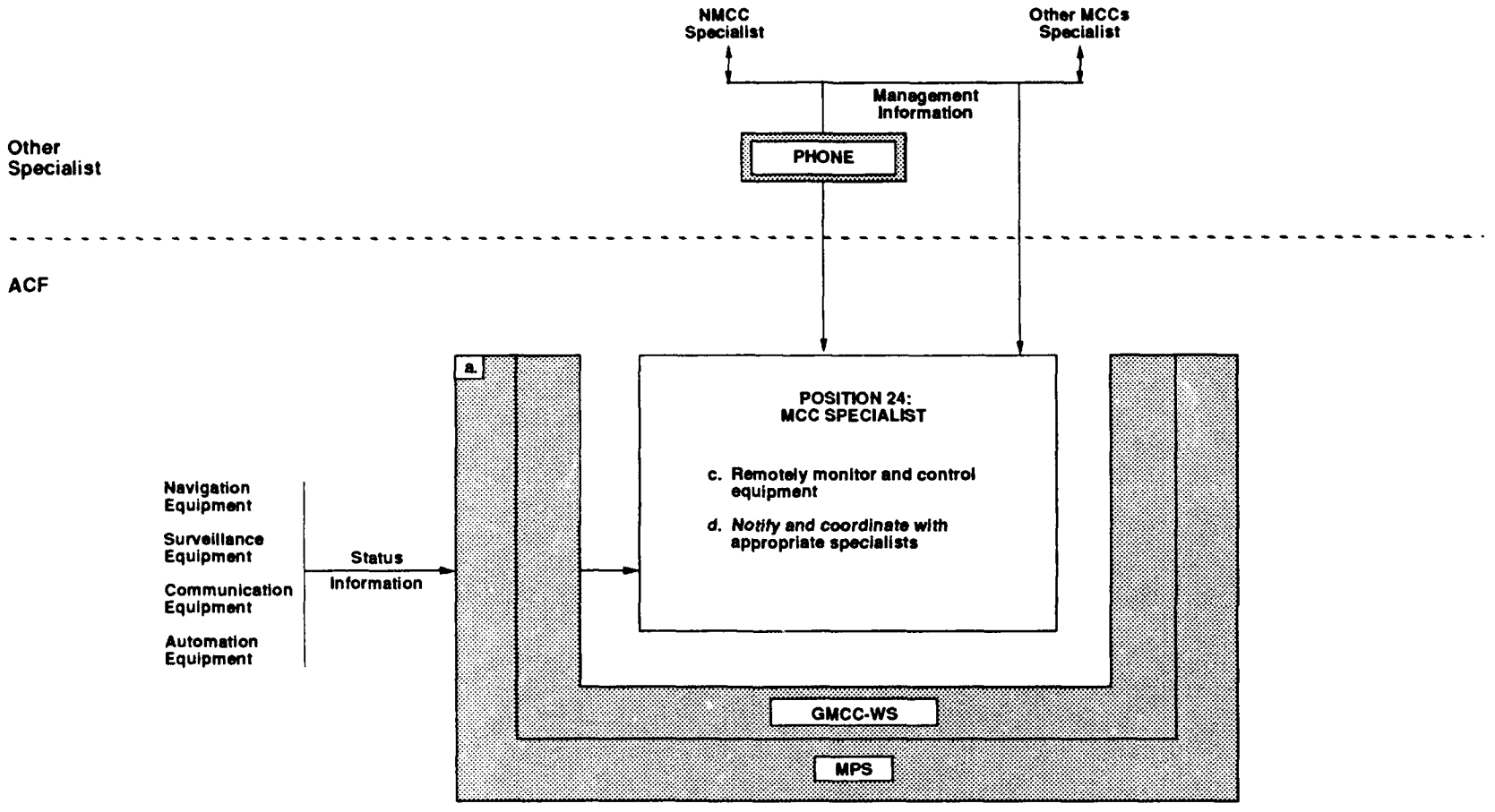

FIGURE 2-6
GNAS-MCC (GMCC) SPECIALIST (POSITION 24)
OPERATIONAL FLOW DIAGRAM

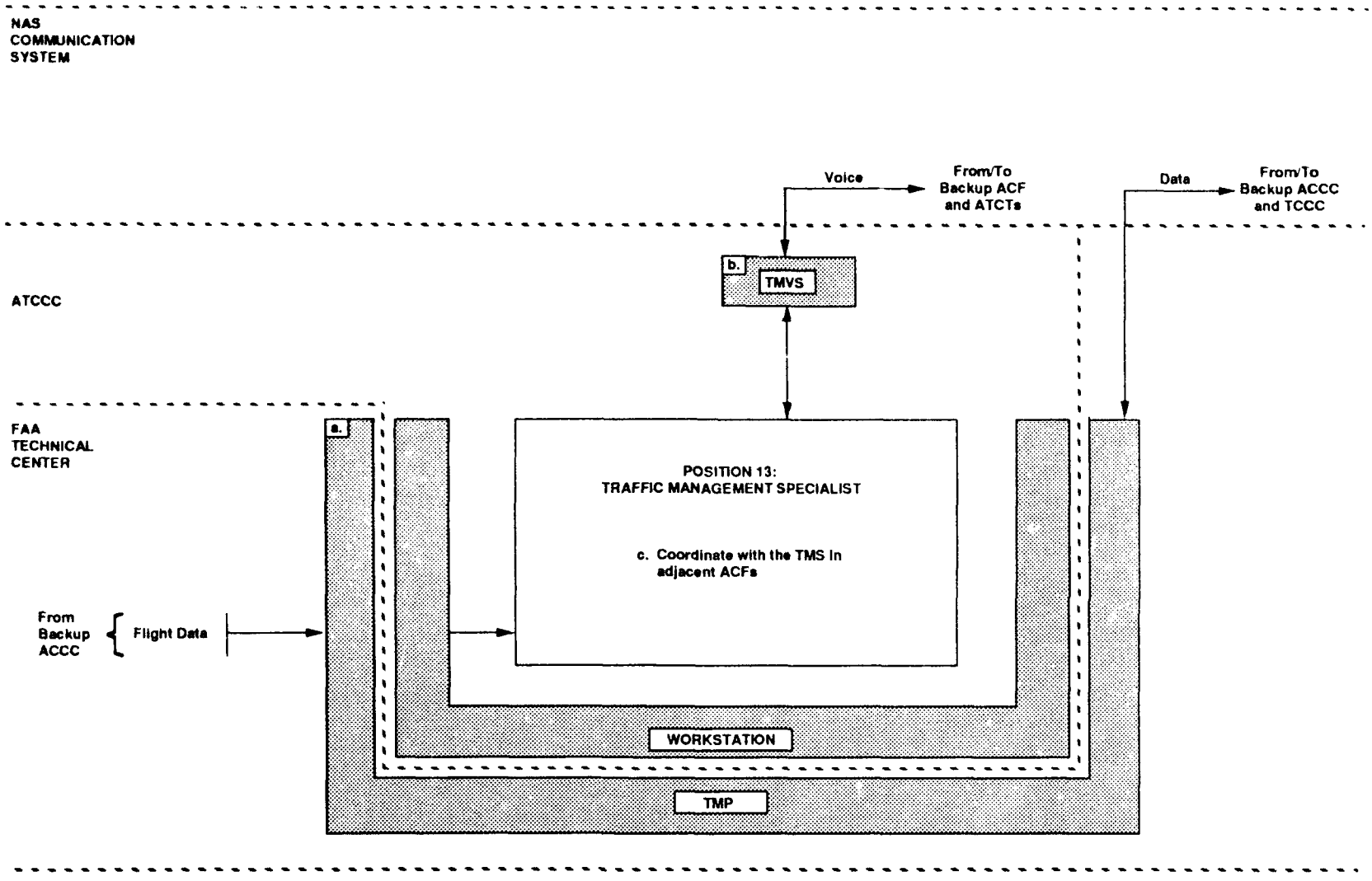

FIGURE 2-7
TRAFFIC MANAGEMENT SPECIALIST (POSITION 13)
OPERATIONAL FLOW DIAGRAM

b. Traffic Management Voice System. The TMVS is used by Traffic Management Specialists to coordinate the rerouting of air traffic around a failed ACFs airspace.

NASSRS Requirement 3.8.3.E

c. Coordinate with Adjacent ACFs. Traffic Management Specialists coordinate traffic flow with other Traffic Management Specialists in ACFs adjacent to the failed ACF.

NASSRS Requirement 3.8.3.E

2.4 Correlation of Operational Requirements

Table 2-1 summarizes the correlation of the requirements paragraph of NAS-SR-1000 with the paragraphs describing system effectiveness. All system effectiveness paragraph numbers of NAS-SR-1000 are listed; paragraphs which are introductory in nature, do not state an explicit operational requirement, or which reference other portions of NAS-SR-1000 are indicated with a dash. The fact that a correlation is shown between a requirements paragraph and a paragraph describing the specialist/controller functions should not be construed as indicating that the requirement is completely fulfilled.

2.5 Operational Sequence

An operational sequence diagram has been developed to illustrate the interaction between specialists/controllers and NAS systems utilized in support of system effectiveness. Support systems are mentioned but their roles are not described in detail. This diagram is general in nature as it is intended to provide an overall depiction of, in this case, the ACF backup process. Operational sequences are based on the end-state NAS as described in baselined documents (e.g., Level I Design). Numbers associated with each "box" on the operational sequence figure are quoted in the next section to help the reader trace this process. A specific situation was developed as a scenario in Section 2.6

2.5.1 Failed ACF Operational Sequence

Figure 2-8 describes an ACF failure and the functions performed by the adjacent facilities. While there are a variety of reasons for an ACF failure this sequence is meant to generally describe the sequence of events that are envisioned to occur.

In this sequence ACF "A" is operating normally (1). ACF "A" validates that is it is exchanging flight data and handoffs (2) with ACF "B" (3), ACF "C" (5) and associated TCCCs at control towers (6), and status information with the MPS within ACF "A" (4). Due to a power failure ACF "A" fails (7) and is no longer exchanging status and control data with adjacent facilities (8).

Once it is verified by designated FAA management personnel that ACF "A" has had a catastrophic failure, ACF "C" personnel will implement the ACF backup plan (9) to establish contact with adjacent facilities around the failed ACF. At this time designated personnel in the ATCTs switch their TCCCs into stand alone mode to continue operations (10). ACF "C" successfully establishes data communication contact with ACF "B" (11) to establish control over the affected airspace. ACF "C" will later establish contact with other affected TCCCs (12) to provide required data.

Table 2-1
SYSTEM EFFECTIVENESS
OPERATIONAL REQUIREMENTS CORRELATION

NAS-SR-1000 PARAGRAPH / NAS FACILITIES		Information				ACF Sys Engineer			ATCT Data Sys Spec		ACF-MCC Spec				GNAS-MCC Spec				ATCCC Spec		
		2.1.1	2.1.2	2.1.3	2.1.4	2.3.1a	2.3.1b	2.3.1c	2.3.2a	2.3.2b	2.3.3a	2.3.3b	2.3.3c	2.3.3d	2.3.3a	2.3.3b	2.3.3c	2.3.3d	2.3.3a	2.3.3b	2.3.3c
3.8.1	OPERATIONAL READINESS	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
3.8.1.A	Categorization of Impact of Loss of Service	x																			
3.8.1.B	Definition of Function Availability	x																			
3.8.1.C	Limitation of Impact of a Single Failure	x																			
3.8.1.D	Maximum Duration of Loss of Service	x																			
3.8.1.E	Maximum Frequency of Loss of Service	x																			
3.8.2	RESPONSE TIMES	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
3.8.2	Response Times		x				x			x											
3.8.3	IMMEDIATE BACKUP	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
3.8.3.A	Air-to-Ground Communications			x		x	x	x													
3.8.3.B	Ground-to-Ground Communications			x		x	x	x													
3.8.3.C	Availability of Surveillance Data			x		x		x													
3.8.3.D	Critical Data			x		x		x													
3.8.3.E	Exchange of Status Information			x		x		x			x	x	x	x	x	x	x	x	x	x	x
3.8.3.F	Operational Reconfiguration			x		x		x													
3.8.3.G	Terminals			x		x		x	x	x											
3.8.3.H	Backup Support Functions			x		x		x													
3.8.3.I	Backup Processing Response Times			x		x		x													
3.8.3.J	Military Facilities			x		x															
3.8.4	SECURITY	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
3.8.4.A	Physical Security				x																
3.8.4.B	Administrative Security				x																
3.8.4.C	Technical Security				x																

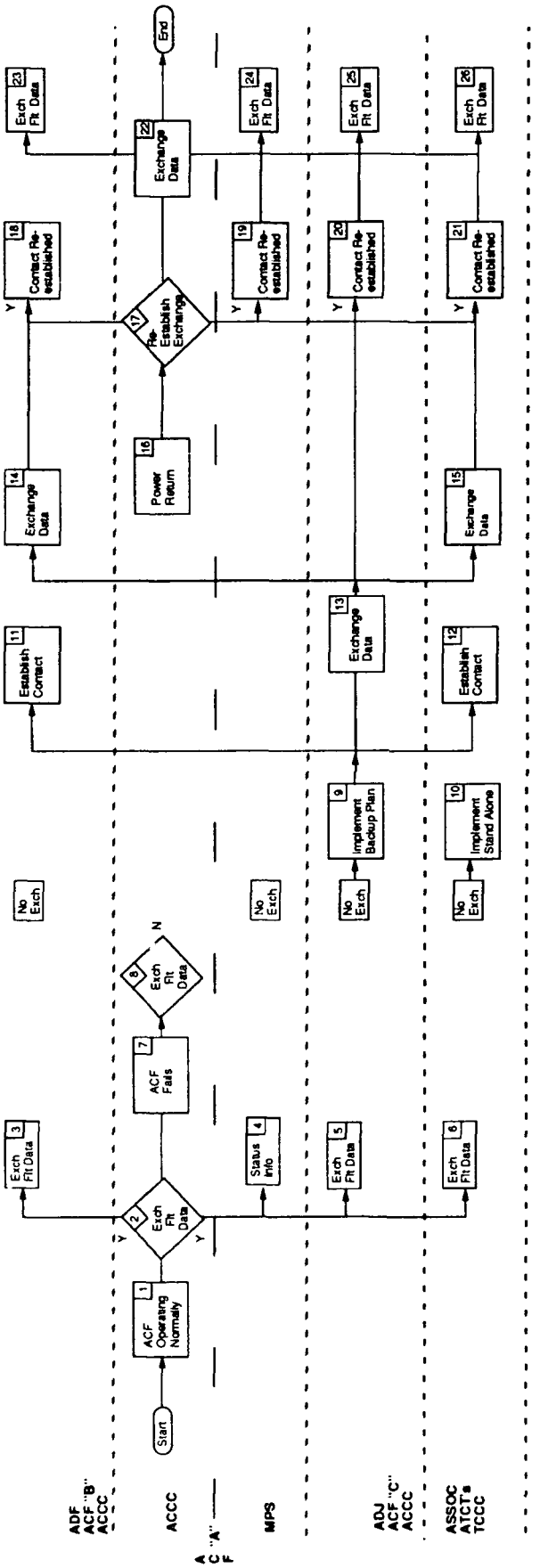

FIGURE 2-8
FAILED ACF
OPERATIONAL SEQUENCE DIAGRAM

ACF "C" (13) continues to exchanges data with ACF "B" (14) and the associated TCCCs (15) until the power at ACF "A" is restored (16), which is verified by designated personnel. ACF "A" re-establishes contact (17) with the ACCC at ACF "B" (18), its own MPS (19), the ACCC at ACF "C" (20), and associated TCCCs (21). The ACCC within ACF "A" exchanges flight data and handoff information (22) with the ACCC at ACF "B" (23), the ACCC at ACF "C" (25), and associated TCCCs (26) and status information with the MPS (24).

2.5 Operational Scenario

The operational scenario presented in this section depicts a specific hypothetical situation illustrating an ACF failure and its adjacent ACF implementing its backup process. It is similar to the sequence diagram in Figure 2-8 in that it shows functional sequences and interactions between specialists. The difference is that the operational scenario shows more detail and only shows one branch where a decision is made. Each row shows the actions on one of the action rectangles generally represents the sequence of their occurrence.

2.6.1 Failed ACF Operational Scenario

Figure 2-9 describes the events that occur when an ACF fails and its backup facilities take over. In this scenario the Washington ACF (ZDC) is operating normally (1). Its ACCC is exchanging handoff and flight data with the ACCC at New York (ZNY) ACF (2), the ACCC at Jacksonville (ZJX) ACF (3), and the TCCC at Washington's National Airport (DCA) (4). The ZDC ACCC is also exchanging status information with its MPS (5).

A catastrophic failure occurs within ZDC (6) and its ACCC can no longer exchange handoff and flight data (7) with its adjacent ACFs (8), (9), with TCCCs such as DCA (10). Once notified that ZDC has failed, designated personnel within the ZNY ACF initiate their backup plan (11). The ZJX ACF personnel also initiate their backup plan once notified (12). DCA tower personnel, realizing that the ZDC ACF has failed, initiate the TCCC stand alone capability (13). Personnel from ZNY coordinate and establish data communication contact (14) with ZJX ACF (15) to activate additional sectors within their facilities to take control over aircraft affected within ZDC ACF airspace.

Flight data and handoffs are effected between ZNY ACF (16) and ZJX ACF (17). Once the ZNY ACF has established data communication with ZJX ACF, contact is established (18) with DCA TCCC (19) for initiating handoff and flight data exchange (20), (21).

The problem within ZDC is resolved and ZDC personnel attempt a restart of its ACCC (22). The restart is a success (23) and the personnel within ZDC re-establish communication contact (24) with ZNY ACCC (25), and ZJX ACCC (26). Once the communication channel has been re-established and flight data and handoffs are being exchanged (27) with ZNY ACCC (28) and ZJX ACCC (29) contact is attempted (30) and established with DCA TCCC (31).

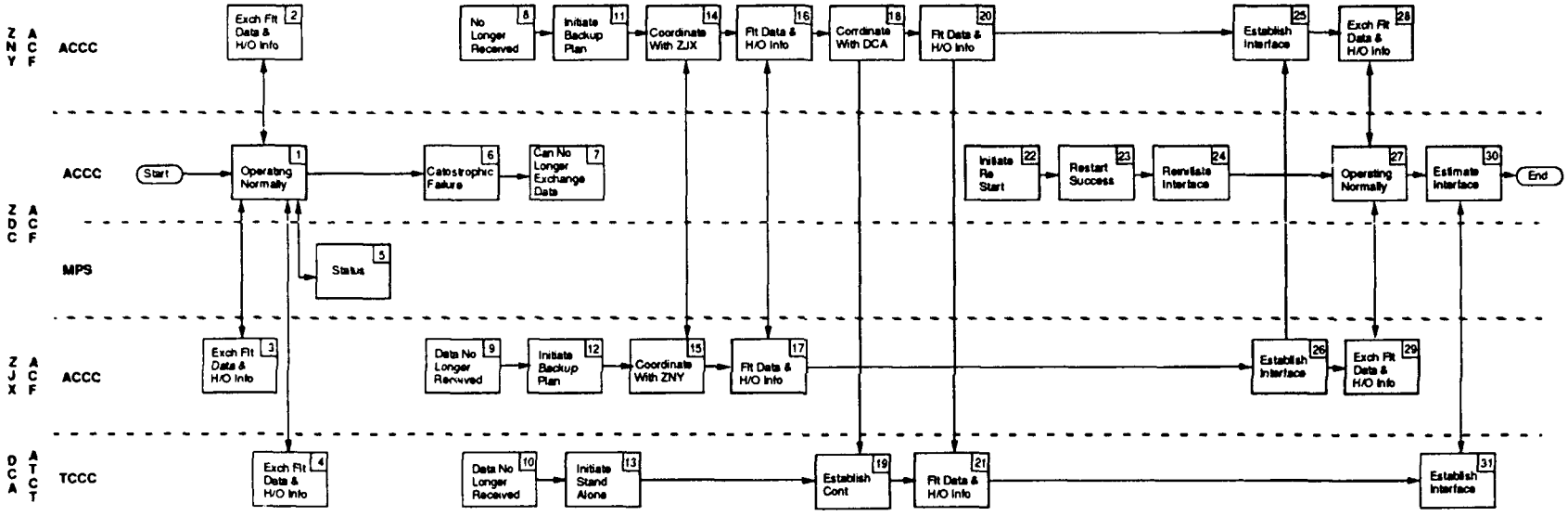

FIGURE 2-9
FAILED ACF
OPERATIONAL SCENARIO DIAGRAM

APPENDIX I
NAS SERVICE FUNCTIONAL CATEGORIES

Table I-1, on the following pages lists the categories of NAS service functions. These functions are categorized as critical, essential, or routine. Critical describes functions or services which, if lost, would prevent the NAS from exercising safe separation and control over aircraft. Essential functions or services are those which, that if lost, would reduce the capability of the NAS to exercise safe separation and control over aircraft. Routine services or functions are those, if lost, would not significantly degrade the capability of the NAS to exercise safe separation and control over aircraft.

Table I-1
SYSTEM EFFECTIVENESS

NAS-SR-1000 PARAGRAPH		CRITICAL	ESSENTIAL	ROUTINE
3.1.1	WEATHER INFORMATION (STRATEGIC)	–	–	–
3.1.1.A	Acquiring & Maintaining Weather Information		X	
3.1.1.B	Priority to Hazardous Weather Information		X	
3.1.1.C	Pictorial Displays of Real-Time Weather Data		X	
3.1.1.D	Weather Presentation to Support Interpretation		X	
3.1.1.E	Flexible & Convenient Access to Weather Information			X
3.1.1.F	Geog Weather Retrieval for All Flight Phases			X
3.1.1.G	Hazardous Weather Information Quality & Currency		X	
3.1.1.H	Weather Information Service in Peak Demand		X	
3.1.1.I	Weather Information Service Available Continuously		X	
3.1.2	AERONAUTICAL INFORMATION (STRATEGIC)	–	–	–
3.1.2.A	Aero Information Currency		X	
3.1.2.B	Aero Information Available Continuously to Specialists		X	
3.1.2.C	Aero Information Available Continuously to Users		X	
3.1.2.D	Aero Information Obtainable by Route or Specific Location			X
3.1.2.E	Adequate Communications Access		X	
3.1.2.F	Adequate Peak Response Times		X	
3.1.3	FLOW CONTROL AND DELAY ADVISORIES	–	–	–
3.1.3.A	Availability of Flight Information			X
3.1.3.B	Weather Data Available for Flow Control			X
3.1.3.C	Capabilities for Flow Control & Delay Advisories		X	
3.1.4	FLIGHT PLAN SUBMISSION AND EVALUATION	–	–	–
3.1.4.A	Receipt of Proposed Flight Plans & Amendments		X	
3.1.4.B	Direct User Input of Flight Plans		X	
3.1.4.C	Support for Multiple Flight Plans			X
3.1.4.D	Interactive Flight Plan Validation & Acceptance			X
3.1.4.E	Capability to Amend Active Flight Plans		X	
3.1.4.F	Dissemination of Flight Plan Information		X	
3.1.4.G	Automated Interfaces			X
3.1.4.H	Communications Capacity under Peak Demand			X
3.1.4.I	Processing Capacity under Peak Demand		X	
3.1.4.J	Capability to Cancel or Close Flight Plans		X	

Table I-1 (Cont)
SYSTEM EFFECTIVENESS

NAS-SR-1000 PARAGRAPH		CRITICAL	ESSENTIAL	ROUTINE
3.2.1	AIRSPACE MANAGEMENT	–	–	–
3.2.1.A	Projection of Demand and Capacity		X	
3.2.1.B	Projection of Arrivals and Departures		X	
3.2.1.C	Determination of Current Location, Altitude, Speed, & Track for Participating Aircraft		X	
3.2.1.D	Prediction of Location, Altitude, Speed & Track		X	
3.2.1.E	Weather Data for Flow Control		X	
3.2.1.F	Determination of Airspace Saturation		X	
3.2.1.G	Allocation of Saturated Capacity		X	
3.2.2	APPROACH AND DEPARTURE SEQUENCING	–	–	–
3.2.2.A	Aircraft Location, Altitude, Speed, Track and Perf	X		
3.2.2.B	Provision of Position Information	X		
3.2.2.C	Support for Sequencing and Spacing Advisories		X	
3.2.2.D	Receipt and Processing of Departure Requests		X	
3.2.2.E	Notice of Deviation from Assigned Flight Paths		X	
3.2.2.F	Recommendations for Current Runway Selection		X	
3.2.2.G	Recommendations for Future Runway Selection		X	
3.2.3	AIRCRAFT SEPARATION	–	–	–
3.2.3.A	Acquiring Actual Flight Information	X		
3.2.3.B	Acquiring Flight Plans		X	
3.2.3.C	Correlation of Flight Plans and Actual Flight Information		X	
3.2.3.D	Weather Information for Flight Path Prediction			X
3.2.3.E	Aircraft Detection in ADIZ, DEWIZ and Continental U.S.		X	
3.2.3.F	Support for Closely Spaced Runways and Routes	X		
3.2.3.G	Surveillance Coverage at Qualifying Aerodromes	X		
3.2.3.H	Display of Aircraft Position and Related Data	X		
3.2.3.I	Display of Geographic and Airspace Structure Data		X	
3.2.3.J	Aircraft Position in Geographic and Airspace Structure		X	
3.2.3.K	Aircraft Clearances		X	
3.2.3.L	Detection of Non-Adherence to Separation Standards	X		
3.2.3.M	Generation of Resolution Advisories	X		
3.2.3.N	Support Upon Non-Adherence to Standards		X	
3.2.3.O	Transfer of Aircraft Control		X	
3.2.3.P	Separation Services Available Continuously		X	
3.2.4	CONTROL WHEN OUTSIDE OF INDEPENDENT SURVEILLANCE COVERAGE	–	–	–
3.2.4.A	Mgmt of Traffic Using Supplemental Nav Syst. when Outside of Ind. Surveil.	X		
3.2.4.B	Data from Aircraft Internal Navigation Systems		X	

Table I-1 (Cont.)
SYSTEM EFFECTIVENESS

NAS-SR-1000 PARAGRAPH		CRITICAL	ESSENTIAL	ROUTINE
3.2.5	COLLISION AVOIDANCE	–	–	–
3.2.5.A	Flight Path Projection and Identification of Potential Collisions	X		
3.2.5.B	Look-Ahead Times for Flight Path Projection	X		
3.2.5.C	Alerts of Potential Collisions	X		
3.2.5.D	Determination of Maneuvers to Avoid Collisions		X	
3.2.5.E	Display of Recommended Maneuvers		X	
3.2.5.F	Collision Avoidance Available Continuously	X		
3.2.6	WEATHER AVOIDANCE	–	–	–
3.2.6.A	Availability of Surveillance Data		X	
3.2.6.B	Availability of Weather Data		X	
3.2.6.C	Provision of Hazardous Weather Information		X	
3.2.6.D	Detection of Weather Intensity		X	
3.2.6.E	Recommendations for Avoiding Hazardous Weather		X	
3.2.6.F	Provision of Recommendations to Pilots		X	
3.2.6.G	Assessing Impact of Avoidance Actions		X	
3.2.6.H	Weather Avoidance Available Continuously		X	
3.2.6.I	Forecasting and Detection of Wind Shear		X	
3.2.6.J	Terminal Area Surface Wind Information Available Continuously		X	
3.2.7	GROUND AND OBSTACLE AVOIDANCE	–	–	–
3.2.7.A	Availability of Flight Plan, Flight Path and Position Information	X		
3.2.7.B	Maintenance of Ground, Terrain and Obstacle Data	X		
3.2.7.C	Availability of Ground, Terrain and Obstacle Data	X		
3.2.7.D	Prediction of Potential Encounters	X		
3.2.7.E	Alerts for Potential Encounters	X		
3.2.7.F	Actions to Avoid Conflicts or Encounters		X	
3.2.7.G	Display of Recommended Actions		X	
3.2.7.H	Avoidance Services Available Continuously	X		
3.2.8	IN-FLIGHT EMERGENCY ASSISTANCE	–	–	–
3.2.8.A	Monitoring and Response to Emergency Transmissions	X		
3.2.8.B	Evaluation and Recommendation of Resolutions for Emergency Situations	X		
3.2.8.C	Airborne Communications Failure		X	
3.2.8.D	Alternate Means of Communications		X	
3.2.8.E	Techniques for Providing Essential Data		X	
3.2.8.F	Determination of Aircraft Location in Emergencies	X		
3.2.8.G	Provision of Distance and Heading		X	

Table I-1 (Cont.)
SYSTEM EFFECTIVENESS

NAS-SR-1000 PARAGRAPH		CRITICAL	ESSENTIAL	ROUTINE
3.2.9	SEARCH AND RESCUE	–	–	–
3.2.9.A	Detection of Overdue or Unreported Aircraft		X	
3.2.9.B	Initiation of Search and Rescue Operations			X
3.2.9.C	Assistance in Search and Rescue Operations			X
3.2.9.D	Monitoring of Emergency Locator Transmissions		X	
3.2.9.E	Facilities to be Contacted in Initial Inquiry			X
3.2.9.F	Messages for Transmission to Other Facilities			X
3.2.9.G	Capability to Exchange Info in S & R Operations			X
3.2.10	SUPPORT OF MILITARY OPERATIONS	–	–	–
3.2.10.A	Airspace Reservations for Military Users		X	
3.2.10.B	Resolving Possible Airspace Conflicts			X
3.2.10.C	Support of Efficient Usage Scheduling			X
3.2.10.D	Communications with Military Aircraft		X	
3.2.10.E	Information on Status of Special Use Airspace		X	
3.2.10.F	Detection of Non-Adherence to Separation Standards		X	
3.2.10.G	Alerts of Potential Breaches of Separation Standards		X	
3.2.10.H	Actions to Assure Adherence to Separation Standards		X	
3.2.10.I	Inhibiting of Separation Standards for Military		X	
3.2.11	AIRPORT MOVEMENT AREA CONTROL	–	–	–
3.2.11.A	Capability to Identify Aircraft and Vehicles		X	
3.2.11.B	Display of Position of Aircraft and Vehicles		X	
3.2.11.C	Geographic Loc of Aircraft and Vehicles		X	
3.2.11.D	Unobstructed View of Movement Area		X	
3.2.11.E	Movement Area Control Available Continuously		X	
3.2.11.F	Communication with Aircraft and Vehicles	X		

Table I-1 (Cont.)
SYSTEM EFFECTIVENESS

NAS-SR-1000 PARAGRAPH		CRITICAL	ESSENTIAL	ROUTINE
3.3.1	FLIGHT FOLLOWING	–	–	–
3.3.1.A	Request & Acceptance of Flight Following Services			X
3.3.1.B	Provision of Flight Following on Request			X
3.3.1.C	Overdue Aircraft Flight Alerts			X
3.3.1.D	Information on Overdue Aircraft			X
3.3.2	TRAFFIC ADVISORIES	–		–
3.3.2.A	Provision of Traffic Advisories			X
3.3.2.B	Safety Advisory and Vectoring		X	
3.3.2.C	VFR Sequencing & Separation in Terminal Phases		X	
3.3.2.D	Adv & Vectoring near Special Use Airspace		X	
3.3.2.E	Info on Aircraft under Traffic Adv Service			X
3.3.2.F	Determination of Potential Traffic Conflicts	X		
3.3.3	WEATHER ADVISORIES	–	–	–
3.3.3.A	Provision of Weather Adv to Aircraft in Flight		X	
3.3.3.B	Weather Advisory Info Available Continuously		X	
3.3.3.C	User Access to Current Hazardous Weather Info		X	
3.3.3.D	Monitoring of Hazardous Weather to VFR Aircraft		X	
3.3.3.E	Assistance in Determining Avoidance Actions		X	
3.3.3.F	Weather Avoidance Communication Links		X	

Table I-1 (Cont.)
SYSTEM EFFECTIVENESS

NAS-SR-1000 PARAGRAPH		CRITICAL	ESSENTIAL	ROUTINE
3.4.1	EN ROUTE NAVIGATION	–	–	–
3.4.1.A	Provision and Support of Navigation Networks	X		
3.4.1.B	Compatibility with Approved User Equipment		X	
3.4.1.C	Information on Status and Loc of Specific Nav Aids		X	
3.4.2	TERMINAL NAVIGATION	–	–	–
3.4.2.A	Navigational Capabilities at Specified Aerodromes	X		
3.4.2.B	Navigational Capabilities Available Continuously	X		
3.4.2.C	Monitoring & Alerts on Navigational Status & Perf		X	
3.4.3	VISUAL NAVIGATION AIDS	–	–	–
3.4.3.A	Curved, Offset and Straight-In Guidance for Visual and Non-Precision Approaches	X		
3.4.3.B	Landing Area Alignment, Height Perception, Roll Guidance and Horizontal Reference	X		
3.4.3.C	Identification and Location of Aerodromes			X
3.4.3.D	Marking of Obstructions Near Landing Areas		X	
3.4.3.E	Specialist Operation of Lighting Systems		X	
3.4.3.F	User Operation of Lighting Systems			X
3.5.1	AIRCRAFT DETECTION AND IDENTIFICATION	–	–	–
3.5.1.A	Detection of Aircraft Entry to ADIZ/DEWIZ		X	
3.5.1.B	Position, Velocity and Altitude of All Aircraft		X	
3.5.1.C	Identification of Aircraft Entering ADIZ/DEWIZ		X	
3.5.1.D	Detection and Identification Available Continuously		X	
3.5.1.E	Exchange of Flight Plan Data		X	
3.5.1.F	Comm between NAS and Military/Law Enf Officials			X

Table I-1 (Cont.)
SYSTEM EFFECTIVENESS

NAS-SR-1000 PARAGRAPH		CRITICAL	ESSENTIAL	ROUTINE
3.6.1	AIR-GROUND COMMUNICATIONS	–	–	–
3.6.1.A	Air-Ground Communication within NAS Jurisdiction	X		
3.6.1.B	Protection from Interference		X	
3.6.1.C	Storage & Retrieval of Air-Ground Communication		X	
3.6.1.D	Operating Position Monitoring			X
3.6.1.E	Air-Ground Comm Available Continuously	X		
3.6.1.F	Reconfiguration of Air-Ground Comm		X	
3.6.2	GROUND-GROUND INTERFACILITY COMMUNICATIONS CONNECTIVITY	– X	–	–
3.6.2.A	Communication between NAS Facilities		X	
3.6.2.B	Communication between FAA and Non-NAS Facilities		X	
3.6.2.C	Secure Data Comm between NAS and DoD Facilities		X	
3.6.2.D	Secure Voice and Data Communication *			
3.6.3	GROUND-GROUND COMMUNICATIONS CAPABILITIES	–	–	–
3.6.3.A	Communication with or between NAS Facilities	X		
3.6.3.B	Reconfiguration of Communication Capabilities		X	
3.6.3.C	Storage & Retrieval of Ground-Ground Comm		X	
3.6.3.D	Interfacility and Intrafacility Comm Available Continuously	X		
3.6.3.E	User Verification and Access Control		X	
3.6.4	NATIONAL EMERGENCY COMMUNICATIONS *	–	–	–
3.6.4.A	Minimum Essential Communications			
3.6.4.B	Emergency Communications Capabilities			

* NO NAS SERVICE FUNCTIONAL CATEGORY ASSIGNED

Table I-1 (Cont.)
SYSTEM EFFECTIVENESS

NAS-SR-1000 PARAGRAPH		CRITICAL	ESSENTIAL	ROUTINE
3.7.1	MAINTENANCE	–	–	–
3.7.1.A	Monitoring and Control of Parameters		X	
3.7.1.B	Flight Inspections		X	
3.7.1.C	Provision of Maintenance Facilities		X	
3.7.1.D	Integrated Logistics Support, Maintenance Management and Logistics Inventory Management		X	
3.7.2	TRAINING SUPPORT	–	–	–
3.7.2.A	Training for Implementation of Maint Philosophy			X
3.7.2.B	Training for Transition to New System and Procs			X
3.7.2.C	Training for Improvement in Skills			X
3.7.3	TESTING SUPPORT	–	–	–
3.7.3.A	Development Test and Evaluation			X
3.7.3.B	Operational Test and Evaluation			X
3.7.3.C	Production Acceptance Test and Evaluation			X
3.7.4	FACILITIES	–	–	–
3.7.4.A	NAS Facility Consolidation			X
3.7.4.B	Design of Manned Facilities		X	
3.7.4.C	Design of Unmanned Facilities		X	
3.7.5	FREQUENCY AND SPECTRUM ENGINEERING	–	–	–
3.7.5.A	Program for New Systems to Ensure Compatability			X
3.7.5.B	Compliance with Standards & Non-Interferanc with Existing Systems			X

Table I-1 (Cont.)
SYSTEM EFFECTIVENESS

NAS-SR-1000 PARAGRAPH		CRITICAL	ESSENTIAL	ROUTINE
3.8.3	IMMEDIATE BACKUP	–	–	–
3.8.3.A	Air/Ground Communication		X	
3.8.3.B	Ground-to-Ground Communications	X	X	
3.8.3.C	Availability of Surveillance Data	X	X	
3.8.3.D	Critical Data	X		
3.8.3.E	Exchange of Status Information	X		
3.8.3.F	Operational Reconfiguration		X	
3.8.3.G	Terminals	X		
3.8.3.H	Backup Support Functions	X		
3.8.3.I	Backup Processing Response Times	X		
3.8.3.J	Military Facilities		X	

APPENDIX II
NAS RESPONSE TIME REQUIREMENTS
(IN SECONDS)

Table II-1, on the following pages, describe the NAS response times (in seconds) that are required to meet the NAS System Requirements Specification. These times are identified as a mean, which is the mid-point between the smallest and largest values, the 99th percentile, and maximum value, or greatest possible number.

For example, Strategic Weather Information is available to the specialist within a 3 seconds (mean), 5 seconds 99 percent of the time (99 percentile), and will always be available within 10 seconds (maximum).

Table II-1
NAS RESPONSE TIME REQUIREMENTS (IN SECONDS)

SECTION	MEAN	99%	MAXIMUM
3.1.1 WEATHER INFORMATION (STRATEGIC)			
G.2 Hazardous and Routine Weather Information shall be Presented to the Specialist within 3.0 Seconds of a Request (Mean Response Time).	3.0	5.0	10.0
H.1 Specialist Access to Weather Information shall be Provided with a Mean Response Time of 3.0 Seconds from the Time a Request for Information is Made.	3.0	5.0	10.0
H.3 Once a User has Gained Access to the NAS, Weather Information shall be Provided with a Mean Response Time of 3.0 Seconds from the Time a Request for Information is Made.	3.0	5.0	10.0
3.1.2 AERONAUTICAL INFORMATION (STRATEGIC)			
F.1 The Time from Initiation of a Request for Aeronautical Information by a Specialist and Receipt of the Requested Information shall not Exceed 10 Seconds.	3.0	5.0	10.0
F.2 The Time from Initiation of a Request for Aeronautical Information by a User and Receipt of the Requested Information shall not Exceed 10 Seconds.	3.0	5.0	10.0
3.1.3 FLOW CONTROL AND DELAY ADVISORIES			
B.1 Current and Forecast Weather Data shall be Available within 10 Seconds of a Specialist's Request.	3.0	5.0	10.0
C.1 Users Shall Receive Requested Flow Control and Delay Advisory Information within 6 Seconds of a Request. ATCCC Specialists and local Traffic Management Coordinators shall Receive Requested Information within 10 Seconds of a Request.	3.0	5.0	10.0
3.1.4 FLIGHT PLAN SUBMISSION AND EVALUATION			
H.2 The NAS shall be Capable of Validating and Processing Proposed Flight Plans and Amendments to Proposed Flight Plans and Responding to the User/ Specialist within 9.1 Seconds (99th Percentile) of the Input.	4.0	5.0	12.0

Table II-1 (Cont.)
NAS RESPONSE TIME REQUIREMENTS (IN SECONDS)

SECTION	MEAN	99%	MAXIMUM
3.14 H.3 (Cont.) The NAS shall be Capable of Validating and Processing Active Flight Plans and Amendments to Active Flight Plans within 9.1 Seconds (99th Percentile) for Probe and Route Amendments and within 9.1 Seconds (99th Percentile for All Other Actions).	0.6 1.5	1.2 3.0	3.0 6.0
3.2.1 AIRSPACE MANAGEMENT			
A.4 Capacity and Demand Projections shall be Performed on Request and the Results shall be Available to the ATCCC Specialists and to the Local Traffic Management Coordinators within 10 Seconds of a Request.	3.0	5.0	10.0
C.2 This Information shall be Available to Local Traffic Management Coordinators Performing a Flow Control Function for Any IFR Aircraft in the Conterminous United States, Alaska and Hawaii on Request and shall be Available within 10 Seconds of a Specialist's Request.	3.0	5.0	10.0
D.4 Predictions shall be Available within 10 Seconds of an ATCCC Specialist or Local Traffic Management Coordinator Request for this Service.	3.0	5.0	10.0
E.1 Current and Forecast Weather Data shall be Available within 10 Seconds of an ATCCC Specialist or Local Traffic Management Coordinator Request.	3.0	5.0	10.0
3.2.2 APPROACH AND DEPARTURE SEQUENCING			
C.3 The NAS shall Response to Specialists' Sequencing and Spacing Inputs in no more than 3.0 Seconds Maximum and Update this Information Base within 12.0 Seconds of Receiving New Flight Information. Responses to Input of Surveillance Information Updates shall be within 2 Seconds.	0.6	1.2	3.0

Table II-1 (Cont.)
NAS RESPONSE TIME REQUIREMENTS (IN SECONDS)

SECTION	MEAN	99%	MAXIMUM
3.2.3 AIRCRAFT SEPARATION			
B.3 The NAS shall Update Flight Plan Information whenever any Changes Occur. Separation Assurance Processing shall be Accomplished in no more than a Maximum of 6.0 Seconds after Validation of an Entered Amendment.	1.5	3.0	6.0
3.2.5 COLLISION AVOIDANCE			
C.2 The Specialist shall be Notified of an NAS Predicted Imminent Collision within 1.2 Seconds (99th Percentile) after the Prediction is Made.	0.6	1.2	3.0
E.1 Recommended Avoidance Maneuvers shall be Displayed to the Specialist within 1.2 Seconds (99th Percentile) after the Prediction of a Collision.	0.6	1.2	3.0
3.2.6 WEATHER AVOIDANCE			
C.5 The NAS shall be Capable of Providing Hazardous Weather Information to Specialists for any Airspace within 100 nmi of the Service Area of the Facility at which the Specialist is on Duty within 3 Seconds (99th Percentile) of a Request.	1.5	3.0	6.0
C.6 The NAS shall be Capable of Providing to a Specialist, upon Request, a Summary of Hazardous Weather Information for any Airspace within the Continental United States. The Mean Response Time shall not Exceed 3 Seconds.	3.0	5.0	10.0

Table II-1 (Cont.)
NAS RESPONSE TIME REQUIREMENTS (IN SECONDS)

SECTION	MEAN	99%	MAXIMUM
3.3.2 TRAFFIC ADVISORIES			
B.4 The NAS shall be Capable of Selecting and Displaying to the Specialist a Recommended Avoidance Vector for an Aircraft with an NAS-Predicted Conflict. This Recommendation should be Displayed within 1.2 Seconds (99th Percentile) of the Prediction of a Conflict.	0.6	1.2	3.0
3.5.1 AIRCRAFT DETECTION AND IDENTIFICATION			
The NAS shall Alert Specialists within 3.0 Seconds Maximum when the Track of an Inbound Aircraft Cannot be Associated with a Flight Plan.	0.6	1.2	3.0

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GLOSSARY

AREA CONTROL FACILITY (ACF) - A consolidated facil established to provide air traffic control service to arrival, departure en route aircraft.

ACF BACKUP - The capability to provide alternate control over the airspace of an ACF that has experienced a catastrophic failure.

ADJACENT FACILITY - A facility whose assigned airspace borders that of the facility being discussed. This applies to an ACF bordering another ACF and to an ATCT bordering an ACF.

AIRCRAFT - Device/s that are used or intended to be used for flight in the air; when used in air traffic control terminology may include the flight crew.

AIRPORT TRAFFIC CONTROL TOWER (ATCT) - A terminal facility that provides ATC services to aircraft operating in the vicinity of an airport or on the airport movement area. Authorizes aircraft to land or takeoff at the airport controlled by the tower or to transit the airport traffic area regardless of flight plan or weather conditions (IFR or VFR). A tower may also provide approach/departure control services.

AIR TRAFFIC CONTROL COMMAND CENTER (ATCCC) - An air traffic service facility consisting of Central Flow Control Facility (CFCF), Central Altitude Reservation Function (CARF), Airport Reservation Office (ARO), and the ATC Contingency Communication and Post.

ATCCC SPECIALIST - Traffic management specialist resident at the Air Traffic Control Command Center (ATCCC) who coordinates with local traffic management specialists at ACFs and manages flow control operations.

AREA CONTROL FACILITY (ACF) - A facility established to provide air traffic control service to aircraft during the en route and terminal phases of flight.

CATASTROPHIC FAILURE - The inability of an ACF to perform its operational responsibilities, regardless of cause, as determined by operational authorities.

CLASSIFIED INFORMATION - Official information, including foreign classified information, which has been designated as requiring protection in the interest of national security.

FLIGHT PLAN - Specified information relating to the intended flight of an aircraft that is filed orally or in writing with an ATC facility.

FLOW CONTROL - Measures taken to adjust the flow of traffic into a given airspace, along a given route, or bound for a given airport so as to ensure the most effective utilization of the airspace.

IFR AIRCRAFT/IFR FLIGHT - An aircraft conducting flight in accordance with instrument flight rules.

INSTRUMENT FLIGHT RULES (IFR) - Rules governing the procedures for conducting instrument flight. Also a term used by pilots and controllers to indicate type of flight plan.

MODE S SENSOR - The Mode S Sensor is a combined beacon interrogator and ground-air-ground data link system that is part of the surveillance facilities. The purpose of Mode S is to provide beacon surveillance coverage

in conjunction with search radar coverage and to provide automated data communications between the aircraft and various ground based processors.

NATIONAL AIRSPACE SYSTEM (NAS) - The NAS as used herein describes the FAA facilities, hardware, software, and the personnel who operate and maintain that equipment to provide services to the user.

SECURE/SECURITY -

1. Measures taken to protect the NAS from all acts designed to, or that may, impair its effectiveness.

2. A condition that results from the establishment and maintenance of measures to protect designated information, personnel, equipment, and installations.

3. A condition that prevents unauthorized disclosure of information that is safeguarded as NAS-sensitive (designated operational/administrative) or is classified in the interests of national security.

SPECIALIST - The internal individual or group who provide service through the NAS (e.g., controllers, engineers, maintenance and management personnel).

SYSTEM EFFECTIVENESS - How well NAS equipment, systems, installations, and facilities are required to perform intended functions under any foreseeable operating conditions. The NAS shall meet user/specialist-related measures of effectiveness by analysis and, where necessary, by appropriate simulation or test.

USER - The external individual or group that receive services from the NAS (e.g., Pilot, Air Carrier, General Aviation, Military, Law Enforcement Agencies).

VISUAL FLIGHT RULES (VFR) - Rules that govern the procedures for conducting flight under visual conditions.

ACRONYMS/ABBREVIATIONS

ACRONYM	MEANING
ACCC	Area Control Computer Complex
ACF	Area Control Facility
	ACF Maintenance Control Center
ARSR	Air Route Surveillance Radar
ASR	Airport Surveillance Radar
ATC	Air Traffic Control
ATCCC	Air Traffic Control Command Center
ATCT	Airport Traffic Control Tower
DoD	Department of Defense
EVCS	Emergency Voice Communication System
FAA	Federal Aviation Administration
FAATC	FAA Technical Center
GMCC	GNAS Maintenance Control Center
GNAS	General NAS Airway Facilities Sector
ICSS	Integrated Communications Switching System
IFR	Instrument Flight Rules
MBO	Military Base Operations
MCC	Maintenance Control Center
MCCP	Maintenance Control Center Processor
MCCP-MMC	MCCP-Maintenance Monitor Console
MDT	Maintenance Data Terminal
MPS	Maintenance Processing System
NADIN	National Data Interchange Network
NAS	National Airspace System
NASSRS	National Airspace System-System Requirements Specification
NARACS	National Radio Communications System
NAVAIDS	Navigation Aids
NICS	NAS Interfacility Communications System
NMCC	National Military Command Center
NMPS	National Maintenance Processing System
RCE	Radio Control Equipment
RCF	Remote Communications Facility
RMMS	Remote Maintenance Monitoring System
RMS	Remote Monitoring Subsystem
TCCC	Tower Control Computer Complex
TCS	Tower Communication System
TMC	Traffic Management Coordinator
TMP	Traffic Management Processor
TMS	Traffic Management System
TMVS	Traffic Management Voice Switch
UHF	Ultra High Frequency
VFR	Visual Flight Rules
VHF	Very High Frequency
VSCS	Voice Switching and Control System